ABSOLUTE DETERMINATION OF THE EMISSION RATE OF BETA RAYS

BY

ROBERT KENLEY CLARK

B.A., Montana State University, 1939
M.S., University of Illinois, 1941

AN ABSTRACT OF A THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN PHYSICS
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ABSOLUTE DETERMINATION OF THE EMISSION RATE OF BETA RAYS

A technique for the absolute determination of the rate of disintegration of beta particle emitters is described. The method consists of measuring the current carried away from the active material by the emitted electrons. The effects of ionization are eliminated by placing the material in a high vacuum. The effects of the surroundings (excluding the parts required to support the active material) are reduced by using apparatus of large dimensions, and the magnitude of these effects is determined by the use of supplementary "cans" and "screens" with various potentials applied to them. Some information is obtained about the effects of the source supporting structures by observing the result when a cover foil identical to the supporting foil is placed over the active side of the source supporting foil. Confirmatory data are presented which indicate that p^{32} activity can be measured by this method to about 5%, Na^{22} activity to about 5-10%, and S^{35} activity to about 10%. In addition the mean energy of S^{35} is determined as 47.5 kilo-electron volts within 6%. It is shown that this technique makes possible a considerable improvement in the precision with which beta ray activities can be measured.

VITA

Robert Kenley Clark was born in Williamsburg, Virginia, on June 24, 1918. He received his elementary and high school education in the public schools in Missoula, Montana. He attended Montana State University from 1935 until his graduation in 1939. He received a B. A. degree with honors in physics, mathematics and chemistry. He was a teaching assistant and graduate student in the Department of Physics at the University of Illinois from 1939 to 1942, receiving the M. S. degree from the University of Illinois in 1941. In 1942 and 1943 he was a research assistant and graduate student in the Department of Physics at the University of Illinois. From 1943 to 1945 he was a research physicist in the Department of Physics at the University of Illinois. Since 1945 he has been a research physicist in the Radiological Research Laboratory of Columbia University in the City of New York. He is affiliated with the Society of Sigma Xi.

In 1945 the American Journal of Roentgeneology and Radium Therapy published a paper entitled, "Biological Evaluation of 20 Million Volt Roentgen Rays. I. Acute Death in Mice" (Vol. 54, page 723, Dec., 1945) which Mr. Clark assisted Dr. H. Quastler in writing.